

Magnets, Magic, and Other Anomalies: In Defense of Methodological Naturalism

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Abstract. Recent critiques of methodological naturalism (MN) claim that it fails by conflicting with Christian belief and being insufficiently humble. We defend MN by tracing the real history of the debate, contending that the story as it's usually told is mythic. We show how MN works in practice, including among real scientists. The debate is a red herring. It only appears problematic because of confusion among its opponents about how scientists respond to experimental anomalies. We conclude by introducing our preferred approach, Science-Engaged Theology.

“The world is full of things that aren’t understood. Almost nothing is understood.” These are the words of Professor Martin Uman, a scientist who studies electromagnetics and energy systems, as interviewed by the hosts of the *Radiolab* podcast (Abumrad 2017). In this episode he is explaining the mysterious phenomenon known as ball lightning, a disconcerting atmospheric event in which a sphere of fire seems to spontaneously form out of thin air. While Uman is happy to hypothesize about the cause, he is quick to point out that “the world is full of things that aren’t understood.”

It would seem from his recent *Zygon* article that Andrew Torrance thinks real scientists don’t talk like that. Doubtless he wishes they *would*. They would be better scientists if they would view the world with as much humility as Professor Uman evidently does when studying ball lightning. Perhaps scientists who are Christians sometimes talk that way, but even then, the temptation to get in on the scientific game that everyone else is playing—the pressure to provide answers “immediately apparent to us”—is often too great. What is to blame, Torrance suggests, is methodological naturalism. Hence, to the question posed by his title, “Should a Christian Adopt Methodological Naturalism?”, we can already guess his answer: an unequivocal No.

Outside of a certain Christian academic subculture, methodological naturalism (MN) is largely unknown. Or, perhaps more accurately, it rises to the level of controversy only within that subculture. Elsewhere, it is considered too obviously *right* to spend time discussing. (This itself may be a point in Torrance’s favor. Obvious answers often turn out not to be; instead they are sometimes a way by which people avoid answering awkward questions.) So, what is methodological naturalism? The *Stanford Encyclopedia of Philosophy* has only a passing reference to it in Torrance’s sense, saying, “this kind of ‘methodological naturalism’ will not be discussed further here” (Papineau 2016, sec 2.1). The only Wikipedia reference to MN quotes the judge’s decision in the Dover, Ohio trial regarding the teaching of Intelligent Design in public schools. In short, you could be forgiven for not knowing what all the fuss is about.

Torrance defines MN as “a method that assumes that the reality of the universe, as it can be accessed by empirical enquiry, is to be explained solely with recourse to natural phenomena” (691). So, *should* a Christian adopt methodological naturalism thus defined? In contrast to Torrance’s unequivocal No, our answer is a qualified Yes. Or, perhaps putting it more carefully, we here argue that the MN debate is a red herring. MN appears necessary to its advocates, in part, *because of confusion among MN opponents about how scientists respond to experimental anomalies*.

We begin by tracing the history of the MN debate (section 2), showing that it occurs on twin tracks, both largely within evangelical theology and philosophy. One track, led by Alvin Plantinga, concerns a debate within analytic philosophy and analytic theology, regarding epistemology and the philosophy of science. The second track occurs among

scientists who are evangelical Christians and regards proper scientific method. Part of the confusion around MN is due to these twin tracks proceeding as though they are a single discussion. What critics of MN bring to the fore—unintentionally—is a real worry; however, it is a misplaced one (section 3). Neither theists nor atheists are required to ‘leave God out’ (as Laplace wanted to do) or ‘force God in’ (as in fact Newton did), *apart from empirical data*. Rather, we must think more clearly about how scientists *in fact* handle anomalies, a task which becomes easier when we pay closer attention to our terms. We should avoid using indistinct words like ‘science’ and ‘religion’ and, instead, name the various scientific subdisciplines (biology, physics) and theological subdisciplines (systematic theology, liturgy, theological ethics, biblical theology), which are thought by MN opponents to conflict. Next (section 4), we pose a number of examples of how anomalies function in real life. We turn to Thomas Aquinas to learn what it looked like from his side of the scientific revolution. What we find is surprisingly like our own side of history: it is not possible to empirically distinguish irregular anomalies from miraculous anomalies. Here we refer to a previously untranslated section of Thomas, together with his little-known work on magic (section 5). As a further example, we study the Roman Catholic canonization process, because we think that is the sort of dilemma that tempts Torrance to abandon MN. Hopefully, we can find a way past without him giving in to temptation (section 6). We conclude (section 7) by reflecting on what difference it makes to view anomalies as a healthy and necessary part of the scientific enterprise. We will list several hallmarks to our preferred approach, which could be called Science-Engaged Theology.

1. What Is this Disagreement Really About? Three Possible Clues

Given that so much of Torrance’s article rides on how MN is defined, it is odd that he does not spend more time on the background to the term. At one point he even concedes, “if this is how MN should be defined, I would not have a problem with MN (and there would be no point to this article)” (720n3). Clearly, then, we must ensure that we are all agreed about what it is! At some points it appears that he only objects to the *word* naturalism (rather than its meaning within MN), because of how the word is used in both MN and a range of associated philosophical views, mostly in epistemology. Is our disagreement with him anything more than semantic? We think so, but how can we tell for sure?

One way of identifying the disagreement is proposed by Torrance himself via his appeal to “Wittgenstein’s dictum that normally ‘the meaning of a word is its use in the language’” (704). So, we would pay attention to the word’s actual use: *either* linguistically, by constructing a genealogy to the term and how it came to be used in our current disagreement, *or* sociologically, by studying current use among scientists. A second way is to see if there is any point on which we disagree that does *not* involve that phrase.¹ The second way will be made clearer as we proceed: we do disagree with him, mostly in places where he thinks faith can change the way a Christian does science—at least in some instances. There are some clues that point to when this becomes a site of disagreement: (a) when he uses a phrase like ‘scientists *qua* scientists,’ (b) when saying that MN is inconsistent because it has a covert theology of nature, (c) when presuming an incompatibilist view of divine agency, and (d) when he uses ‘natural’ in a loaded way: sometimes as a synonym for secular, sometimes as a synonym for empirical, and even seemingly as a synonym for naturalistically. We explain below why these are locations of disagreement.

What about the first way: his suggestion that this could be solved by Wittgenstein? Fortunately, the sociological work has been done for us. As Elaine Howard Ecklund’s and Christopher Scheitle’s exhaustive research has shown in *Religion vs. Science: What Religious People Really Think*, nearly 50% of scientists she studied were religious, and it was rare (or even non-existent) for them to experience the cognitive dissonance Torrance thinks is

common (2017). The real scientist doesn't think that she "brackets out her belief in God" to adopt MN (693). They are clear about what Torrance fears might be a source of confusion: there is no slippage between methodological naturalism and metaphysical naturalism, even if we are only referring to the concepts apart from words.² How the word has been used in preceding scholarly debates forms the basis for the next section, where we trace the conceptual genealogy of MN.

2. The Mythic History of the MN Debate

The story, as it's usually told, gives Paul de Vries credit for starting the MN debate with his 1986 article, "Naturalism in the Sciences: A Christian Perspective," published in *Christian Scholar's Review*. For example, both Numbers' earlier history of the concept and Poe and Mytyk make this claim, with the latter even going so far as to interview de Vries to get the backstory about the coining of the term. The real story is somewhat more complicated.

The source of the article itself might have been an indicator that the MN conversation was about to divide into two separate conversations, as *CSR* is hardly a science journal. Indeed, from the start, replies to de Vries's article progressed along two different tracks, one among philosophers responding to the (then new) Reformed epistemology of Plantinga and Wolterstorff, and one among evangelical scientists. Later on, as Numbers shows, the debate became embroiled in the Intelligent Design controversy, but this is less germane to our topic.

De Vries, for his part, doesn't engage scientists or even philosophers of science. Instead, his original piece is functionally a review article of Wolterstorff's *Reason Within the Bounds of Religion*; more than half the footnotes are to that short work. This book, together with *Faith and Rationality*, helped to launch Reformed epistemology. It is almost as though de Vries uses the plight of the Christian scientist as a case study to highlight problems with Reformed epistemology, rather than being interested in MN itself.

"Must a Christian who is a natural scientist live a double life?" de Vries asks. Because, according to Wolterstorff, it sure seems like she must. The Christian has certain 'control beliefs' which prevent her from considering certain scientific proposals, for example, B.F. Skinner's behaviorism. De Vries is no more a fan of Skinner's than is Wolterstorff, but he prefers to respond by engaging the specific details of the theory, rather than, as he sees it, hiding behind his control beliefs: "Christians can well value behaviorist psychological theory while denouncing the misguided attempts to pervert such a psychological theory into an entire philosophical anthropology" (De Vries 1986, 392). De Vries cautions against linking methodological naturalism with *metaphysical* naturalism; perhaps Wolterstorff is guilty of doing exactly this: "Metaphysical naturalism is a philosophical perspective that denies the existence of a transcendent God. Methodological naturalism does not deny the existence of God because this scientific methodology does not even raise the question of God's existence. Unfortunately, these two kinds of naturalism have often been confused" (De Vries 1986, 389).

We can see why the scientists who replied were sympathetic to de Vries's proposal. De Vries 'gets' what scientists see as their mission, much more than does Wolterstorff. As de Vries puts it: "In brief, explanations in the natural sciences are given in terms of contingent, non-personal factors within the creation. If I put two charged electrodes in water, the hydrogen and oxygen will begin to separate. If I were writing a lab report (even at a Christian college!), it would be unacceptable to write that God stepped in and made these elements separate" (Vries 1986, 389). Many of the scientists or philosophers of science responding to de Vries did so by appealing to history, by showing how MN was always the name of the scientific game going as far back as Boyle, Newton, and even Aquinas and his mentor, Albert the Great. Some of these scientists even included theological reflection that shows MN to be

consonant with Augustinian doctrines of sin and divine freedom (Bishop 2013). At the same time, we can also guess why Plantinga and Wolterstorff are opposed: their paths on the twin tracks go back not to the beginnings of modern *science*, but rather, the beginnings of modern *epistemology*—namely, classical foundationalism.

In case there is any doubt about Plantinga's real target, consider how he starts his critique: "According to an idea widely popular since the Enlightenment, science ... is a cool, reasoned, wholly dispassionate attempt to figure out the truth about ourselves and the world, entirely independent of ideology, or moral convictions, or religious or theological commitments." And that, in turn, forms the basis for MN; adopting MN guarantees that your scientific research will produce knowledge *of that sort*. The key problem, from Plantinga's perspective, is science's purported neutrality—since "science is anything but religiously neutral" (Plantinga 1997).

Plantinga is explicit that this is the origin story for his MN genealogy. The ancestors of MN were not scientists like Darwin, Bacon, or even Boyle, but instead philosophers developing an epistemology fit for the modern age. But one of these villains *was* Boyle's friend and his Oxford colleague: "One root of this way of thinking about science is a consequence of the modern foundationalism stemming from Descartes and perhaps even more importantly, Locke" (Plantinga 1997). We don't have any stake in defending foundationalism, be it Cartesian or Lockean, since we agree with Plantinga that it has, in his words, "run aground." In fact, we even agree with Plantinga's Reformed epistemology, at least in its broadest terms, that some sort of replacement is needed for the characteristic epistemologies of modernity. What we want to challenge is his genealogy. The key tenets of MN far *preceded* modern epistemology and, what is more, Plantinga's critique of MN by linking it to foundationalism is misguided. His critique is either (a) right but trivial, or (b) wrong.

Perhaps what Plantinga means when he says that foundationalism has run aground is simply to point out, "*Of course* the Enlightenment ideal of wholly perspectival-less knowledge is not true." That would make Plantinga's objections right but trivial. If you read the *Essay Concerning Human Understanding* and *Some Thoughts Concerning Education* closely enough, you can tell even *Locke* didn't think it was true! (Wolterstorff 1996) Instead, we think that Plantinga's real objection simply misses the mark by blaming MN as such for what is really at fault: the fact that scientists tend not to be as philosophically careful writers as Alvin Plantinga is. His two main examples of Christian belief leading to different conclusions than 'science' (and consequently his basis for saying that MN cannot be neutral) come from Rodney Stark and Herbert Simon.³ However, in both examples Plantinga in fact demonstrates a different conclusion than the one he intends.

In short, some scientists—especially Rodney Stark!—are not particularly skilled at properly distinguishing their strictly empirical claims from their non-empirical ones. Mostly, in Simon, this takes the form of the author imposing value judgments on what should have been simply different approaches to rationality. What really irks Plantinga, apparently, is Simon's implication that Mother Teresa's rationality is somehow 'docile'. But suppose Simon had labelled her rationality, Type A, with no suggestion of hierarchy or the connotation that docility is somehow better or worse than another approach, without the negative implications colloquially associated with the word 'docile.' It's true that this would not make either Plantinga or us more inclined to agree with Simon's supposed findings, but what it would do is distinguish our objections based on Simon's dodgy metaphysics *from* questions about the validity of Simon's experimental method, and consequently render MN beside the point.

Simon is only partially at fault, however: sometimes even Alvin Plantinga writes without sufficient philosophical care. Plantinga is guilty of assuming the pejorative

connotations of docility, while Simon was using a far more technical meaning. As Simon writes, “docility is characterized, then, by a stage of exploration and inquiry followed by a stage of adaptation” (Simon 1976, 85). In short, Simon was using docility synonymously with teachability. Moreover, he was aware of the potential for misunderstanding about the word and worked particularly hard to indicate that the pejorative connotations were not what he meant. As Charles McMillan writes, Simon “was never satisfied with the word *docility*, thinking the vulgar usage gave docility an unintended meaning. Yet [Simon’s work] remains true to the original meaning of docility, teachability or instructability and how individuals learn from social channels for information and advice for decision choices” (McMillan 2016, 92). Perhaps this serves to emphasize the point that interdisciplinary communication is difficult, requires nuance, and is easy to get wrong.

Yet another example is in Plantinga’s use of Stark. Ironically enough, this insight can be found in Torrance’s interpretation of that exchange. As he puts it, Stark’s presuppositions could “take a more neutral stance to the question of whether or not God exists—a stance that seems much more appropriate to the scientific task. What Plantinga demonstrates in this example is a way in which MN can bias science (or sociology) in a way that needlessly makes a theory incompatible with theism, when *there is no scientific reason for doing so*” (706, emphasis added). Torrance demonstrates the point nicely: the apparent tensions between theology and science are often blamed on MN but are due to less-than-careful writing among scientists—and ironically among some philosophers too.

So much for the various tracks of reply to de Vries’s original article endorsing MN. The punchline to all this background, however, is that it was *not* de Vries who coined the term. That turns out to be a long-running myth. Obviously, de Vries didn’t coin the *words* methodological naturalism, but we mean more than that: he didn’t even devise the concept.⁴ It was the work of philosopher Edgar Brightman, which far precedes the current debate and, more promisingly, suggests a new way out of the *cul de sacs* in which the twin tracks have led us.

Brightman was a philosopher at Boston University and an ordained Methodist minister, but he is better known as the teacher and mentor of Martin Luther King. In 1937 he delivered the presidential address to the APA, eastern division, in which he said:

Such a universal naturalism—common to idealists and realists, to naturalists and theists alike—may be called scientific or methodological naturalism. But methodological naturalism is sharply to be distinguished from metaphysical naturalism. The latter takes the incomplete descriptions and heuristic methods of the former to be either final truth about reality or at least the limits of present human knowledge. Hardly any naturalist of today would be so rash as to take them as final truth. *Certainly no man of science would do so*; and any philosopher, whether naturalist or theist, cuts a sorry figure when he strikes a dogmatic pose. (Brightman 1937, 158)

In contrast to Plantinga’s take, here there is scarcely a word about neutrality, or “cool” reason, or “wholly dispassionate” truth. Instead MN is guided by the following. First, he focuses on the scientist’s tools, and not on the unanswerable and hopelessly vague question, “What is proper science?”, abstractly conceived.

Second, he strives to speak of these tools each within its own subdiscipline of science. What would count as evidence in physics is not necessarily the same for biology, much less in psychology and theology. Each has its own set of practices, traditions, virtues, and criteria for verification. One of the pitfalls in talking about ‘science and religion’ in those terms is that it papers over such distinctions among the various scientific subdisciplines (biology, physics) and theological subdisciplines (systematic theology, liturgy, theological ethics, biblical theology). As Brightman puts it:

There is more than one kind of verification. Each science has its own concept of verification, which may differ from that used in another science. A mathematician verifies his results by one type of procedure, a physicist by another, an historian by another. Confusion between the kind of verification possible in physiology and that possible in psychology gave rise to extreme behaviorism. ... To derive a concept of verification from one field and to clamp it down on all fields is, even when baptized by the sacred name of scientific method, not method, but methodological dogmatism, or methodological chaos. After all, the nature and limits of verification are determined by the nature and limits of the field of investigation. (Brightman 1937, 149)

In addition to these first two points, there is the sense that none of these are *new* divisions between ‘scientific’ knowledge and other ways of knowing. Contra Plantinga, this didn’t arrive on the philosophical scene with foundationalism. The contrast between what we can know with our senses, that is empiricism, and other ways of knowing, was well-established in the medieval university; none of it is the fault of ‘secularism’ or the Enlightenment. These lessons from Brightman will guide our discussion.

3. Is MN Humble or a Temptation?

One of the strengths of Torrance’s article is that he provides plenty of real life examples of the ways that MN, as he sees it, distorts Christian belief. Surprisingly it is rare to provide such concrete examples, both among adherents of MN and detractors, and Torrance helpfully defies this norm. Plantinga also defies the norm, listing three examples of supposed conflict between Christian belief and certain scientific studies in one article, and another (Rodney Stark) in his book, *Where the Conflict Really Lies*. Ironically, it was Torrance himself who leads us to conclude that the real lesson from Plantinga’s examples is not that we should necessarily abandon MN. Instead, the lesson to be learned is that *sometimes* scientists are not sufficiently philosophically careful—as Torrance demonstrates with Stark and as we hinted with Simon. If there are reasons to disagree with Simon or Stark on scientific grounds, then by all means let’s hear those. But if those are Plantinga’s reasons for opposing MN, it is a red herring.

Irony aside, could the same be true of Torrance’s article? He advocates an approach that he labels “theologically humble,” one within which “a Christian’s practices should always reflect her belief that the universe is created and sustained by the triune God.” What difference would it make to actual scientific practice if she believed in the triune God? He answers: “This leads me to contend that the Christian should adopt a theologically humble approach to the sciences (instead of MN), with which she humbly acknowledges that special divine action is not discernible by empirical science” (691). He attributes the temptation to adopt MN, and by implication the more prideful less humble approach, to the laudable (but ultimately misguided) desire to avoid stopping science. ‘Stopping science’ is what happens when a person jumps to the conclusion that *God did it* when faced with a seeming miracle. So, if a person appears to have been healed in a way that eludes medical explanation, contemporary science will not see ‘God answered our prayers’ as a satisfactory answer. Instead, such healing will invite further empirical investigation—investigation that could serve to benefit others with similar illnesses.

While recognizing that many in the field insist that MN is distinct from metaphysical naturalism, Torrance suggests that adopting MN actually “presupposes a theology of nature (that there is a creator to bracket out), even though this is precisely what is ruled out by a naturalistic method.” He continues: “It is important to be clear here that *MN does not bracket out God*; it is the Christian who brackets out her belief in God in order to adopt MN. As such, once the Christian has committed to studying the world by way of MN, she operates with the assumption that the entire structure and behavior of the natural physical world requires to be

explained without God, without a theology of nature.”⁵ In other words, Torrance argues that the Christian scientist is forced to exclude from her research aspects of her theological knowledge of reality that are, in fact, relevant. In so doing, she is both prematurely precluding a full explanation of the phenomenon in question, and also being forced to inappropriately adopt a provisional atheism.

Pay attention to how Torrance uses MN in two different ways: MN implies no theology of nature, but instead it *becomes* a theology of nature. This suggests, among other things, that he has an incompatibilist view of divine agency, in which affirming an event as divine action implies that there is no natural explanation for that event. Or at least he sometimes speaks this way. For example, consider his use of ‘natural’ as a synonym for ‘secular’, or the way in which ‘naturalistic’ is used in the following passages: “When MN is adopted, all scientific explanations are limited to naturalistic explanations” or “So, by adopting MN, the Christian decides that a naturalistic understanding is more appropriate to the scientific task than her theistic or Christian understanding” (700). If that is his position, it is no wonder that he thinks MN is indistinguishable from metaphysical naturalism! In fact, reading Torrance generously, we think that is not his view, all things considered. His view is somewhat subtler.

Instead, what is really going on should prompt us to return to the lessons gleaned from Brightman’s original article, which was written long before the current (post-de Vries and Plantinga) debate. How could Brightman help Torrance to reframe his concerns? Recall that the lessons were, one, focus on the *tools* appropriate to each discipline and not on some abstract definition of science and religion. Two, standards of verification differ among disciplines, which is another way of saying that epistemology (what counts as knowledge?) is discipline-specific. Three, none of this is new, and certainly not modern (i.e., post-Descartes).

Consider how this would shape Torrance’s critique, beginning with his proposal of a ‘humble’ approach, in which he says that the scientist should acknowledge “that special divine action is not discernible by empirical science” (691). But what does he mean by discernible? If his argument is that scientific method cannot identify an event as special divine action *as such*, then of course we would agree: scientific method (and thus MN) can never say that an observable event has or has not been caused by God. If, however, he wants to say that he knows what the secondary causes or physical processes involved in special divine action would look like—or, if he knows for sure that there are not any processes to be discerned—then this approach begins to sound anything but humble, for *who knows what* special divine action looks like empirically?

The same is true for other passages, quoted above. So, when he says, “When MN is adopted, all scientific explanations are limited to naturalistic explanations,” Brightman would remind us to keep the focus on what scientists actually do: study things empirically.⁶ If that is rewritten, it would read: *all scientific explanations are limited to empirical explanations*. This is unremarkable to the point of being trivial. Something similar could be said about his assertion *that by adopting MN, the Christian decides that empirical understanding is more appropriate to the scientific task than her Christian understanding*.

Perhaps nowhere is this clearer than Torrance’s analogy with vegetarianism (720n6). Instead, consider this reworked form of the analogy. Imagine a volleyball referee who makes a controversial call; maybe she calls a serve out. When the players are still arguing with her, her iPhone beeps. It is a message from her son, who is also at the game: SERVE WAS IN. Suppose further that she has no reason to doubt her son’s word: he has good enough eyesight, his view was unobstructed, and she knows him to be trustworthy and knowledgeable enough about the rules of volleyball. Nevertheless, she should not change her call. Why not? Her role as referee requires her to make the call based on what *she* sees. She may come to doubt her initial call but changing it based on her son’s testimony would be to play a different game, as

it were.⁷ Depending on the league's rules, she could refer to instant replay, but being a referee means relying on the tools given to her, appropriate to the practice in question. She must call things as she sees them, rather than relying on authority, not because she doubts the authority, but only because accepting outside testimony isn't one of her tools.

How would this apply to Torrance's most oft-cited examples? Take Jesus' miracle of turning water into wine. If we were able to observe what was happening at the microscopic level when this occurred, we would see water molecules being physically changed into alcohol molecules. Otherwise, there would not be any wine to observe. Hypothetically, we might see an actual fermentation process taking place at a rapid (seemingly instantaneous) pace. A chemist observing this process would certainly acknowledge the physical changes themselves but would be limited to describing what she can actually see. Similarly, take the seemingly trickier example of Simon Peter's confession that Jesus is "the Christ, the Son of the living God." Trickier since, as Torrance points out, Peter's belief was not revealed by anything empirical: "what flesh and blood cannot discern" (Matthew 16:17). While this might feel like a completely immaterial, subjective experience, who knows *what* secondary causes were used to reveal it to Peter, apart from "flesh and blood, but by My Father in heaven." And, as such, who knows what could be discerned from Peter's conscious reasons or neural activity?⁸ Just as the chemist might analyze the water-into-wine process, so might a neurobiologist use an fMRI to observe the neural changes occurring during one's experience of God.

Long before the invention of the fMRI, Thomas Aquinas makes this point. Even though some miracles are hidden (in his words, "not manifest to the senses"), the effects are visible: "the Apostles were endowed with knowledge without studying or being taught ... although not manifest in itself, yet was made manifest in its effect" (Aquinas *ST*, 1:105.7). In all of these examples, a physical change accompanies God's action, and this physical change is observable. What once was water is now wine; what was once two loaves of bread is now enough to feed five thousand; he was dead and now he lives. Even though such events would not be recognized by the scientist as divine actions, the secondary causes involved would indeed be observable, if and when they happened.

4. Of Red Herrings and Anomalies

What this section has taught us is that MN's critics were onto something worthy of note all along, but the fault doesn't lie with MN; that misdescribes the problem. Instead, we have argued throughout that while all scientists should be methodological naturalists, or something close to it, the problem that Torrance points to is, in fact, a red herring. This is the wrong question to be asking. What would the right question be? *What should the theistic scientist do when faced with something which looks like God "producing the effects of secondary causes without them?"* (Aquinas *ST*, 1:105.6). And the right answer is: exactly the same as what all scientists should too, be they theistic or not. That is, record it as an anomaly, restate your preliminary conclusion in the form of a *testable* hypothesis, and await more data. If something seems anomalous right now nothing should compel the careful scientist to render a conclusion in advance of sufficient data. Such a scientist will always *keep digging*.

Say, for example, that an unexpected and dramatic physical recovery occurred, which a theist was tempted to deem a miracle. (Such a scientist would not be humble if she gave in to this temptation.) Torrance assumes that in this situation, an MN-affirming scientist will insist that God did not perform this healing, and that there is most definitely a naturalistic explanation for the recovery. In his words, "The trouble with MN ... is that it does not allow the Christian scientist *qua* scientist to recognize miracles as blind spots. MN requires the Christian scientist *qua* scientist to offer naturalistic explanations of these spots that are likely to be inconsistent with her Christian understanding" (701). This is not so. Even employing

Torrance's own definition, MN requires nothing of the sort. MN does not involve an active prohibition on God's activity, but instead maintains a focus on the tools of empirical research. The MN-affirming scientist faced with a seemingly unexplainable phenomenon will acknowledge that an observable event has indeed occurred and will affirm that this event is indeed unexpected and anomalous; she will absolutely see this as a blind spot.

Torrance himself acknowledges that this *should* be the case when he affirms that "a scientific approach should allow anomalies ... to challenge and thereby revise their interpretive models and methodology" (701). The difference between his position and our own is that he seems to think that this methodological focus on strictly empirical explanations somehow involves the more active assertion that the theistic scientist must pretend as though God has not acted. This is not the case; using the tools of empirical science, she will simply focus on the empirical explanations available to her, and appropriately acknowledge the knowledge gaps that remain to be filled. Anomalies, for the scientist, are not threats to scientific method, but an invitation to keep digging; to inquire further into possible mechanisms and causes for the unexplained event, and to allow such anomalies to provoke ongoing research. No, a scientist will not posit divine action as a causal factor in anomalous events—but *neither will she invent a naturalistic explanation in order to preserve an overarching metaphysical naturalist worldview*. A good scientist understands that "I don't know" or "I don't know yet" is always a valid answer.⁹

Scientific practice recognizes anomalies as vital to the progression of scientific knowledge. Indeed, anomalies have long been acknowledged as vital to scientific progress. Thomas Kuhn, in *The Structure of Scientific Revolutions*, relies heavily on the role of seemingly-unexplainable experimental data in instigating eventual scientific revolutions. As he writes, "awareness of anomaly opens a period in which conceptual categories are adjusted until the initially anomalous has become the anticipated" (Kuhn 2012, 64). In other words, the role of unexplainable phenomena in scientific process is not to direct one's attention to possible supernatural causes, but to test the robustness of current scientific paradigms. If anomalous phenomena accumulate to such an extent that a scientific paradigm itself is being called into question, then the paradigm itself might be altered or replaced altogether. Indeed, the history of science is replete with examples of seemingly supernatural or anomalous phenomena subsequently being explained in strictly empirical terms.

There are different sorts of anomalous or seemingly unexplainable events. As Kuhn notes, "if an anomaly is to evoke crisis [and subsequent paradigm change], it must usually be more than just an anomaly" (82). It would have to be the sort of thing that could be observed with some sort of predictability and regularity. So, it is important to distinguish between repeatable, predictable phenomena that currently have no explanation, and true anomalies that are unexpected and do not fit current scientific frameworks. For Kuhn, the odd anomaly needs to rise to the level of predictable but currently-unexplainable, in order for it to initiate paradigm change. In a subsequent section, we distinguish between currently-unexplainable *regular* anomalies and *irregular* anomalies (which is where a phenomenon like water turning into wine would fit; call it *seemingly miraculous* anomalies). Importantly, however, the scientific approach to regular, irregular, and seemingly miraculous anomalous phenomena should be the same: one of curiosity and willingness to pursue further research.

The history of science is full of examples in which seemingly unexplainable phenomena are subsequently rendered explicable in empirical terms. Indeed, those who have *not* adopted a posture of curiosity in the face of anomalies and the unexplained have often lived to regret it. For example, take the infamous case of Isaac Newton who, when analyzing the motions of the planets, surmised that the gravitational interactions between planets (and not just between planets and the sun) would eventually cause their orbits to erode. These interactions between planets, Newton writes, "will be apt to increase, till this System wants a

Reformation” (Newton 1704, query 31). And how will that Reformation be accomplished? Invoking Torrance’s words, by special divine action.

Newton saw this apparent astronomical problem not as a scientific challenge, but as an opportunity for God to be directly involved with the physical world. This striking story of “God of the gaps” thinking by Newton himself is only enhanced by its epilogue a hundred years later. As the (apocryphal?) story goes, the French mathematician Pierre-Simon Laplace had an encounter with Napoleon in which the two were discussing Laplace’s work on planetary motions. Laplace, for his part, had completed his work without reference to God as creator or sustainer—or Reformer. When questioned by Napoleon about this lack of God in his exposition, Laplace was reported to have replied, “I had no need of that hypothesis.” We see here a striking example of an assertion of direct divine activity, and a subsequent articulation of a perfectly adequate scientific explanation. Here, Laplace clearly embodied the spirit of MN, and it is difficult to avoid the conclusion that a rejection of MN, such as Torrance has proposed, at the very least opens the door to the sort of ‘miracle’ posited by Newton, one which in retrospect proves embarrassing.

While Newton offers an example of how not to treat anomalous or unexplainable phenomena, we also find examples of present-day scientists willing to acknowledge the reality of phenomena currently lacking explanations. In fact, it is so common as to be unremarkable for scientists to happily admit “we cannot explain this phenomenon” (Tamura 2013, sec 2.5). This is simply part of the scientific process, and an integral one at that. What is perhaps more interesting than the mundane admission of gaps in mechanistic explanations are examples of seemingly ‘spiritual’ interventions that have observable, physical effects. For example, acupuncture is a practice within traditional Chinese medicine that has its conceptual basis in the concepts of *qi* (a life force), meridians, and yin and yang. None of these spiritual concepts has a basis in scientific knowledge, and acupuncture as a form of alternative medicine has been often critiqued. This being the case, it is perhaps surprising that acupuncture is available through the UK’s health care system, the NHS, often for chronic pain or migraines. Why would an evidence-based health care system like the NHS provide a treatment that has been critiqued as pseudoscientific? The answer to this is that even though the precise mechanisms operative in acupuncture are debated and not fully understood, the practice is observed to have demonstrable effects in some cases. Hypothesized mechanisms include the release of endorphins, increased blood flow, and anti-inflammatory effects resulting from stimulation of the vagus nerve. What is perhaps most interesting is that doctors will often suggest acupuncture for specific conditions, while still acknowledging that they do not yet understand the precise mechanism behind this efficacy. As one concrete example, consider *in vitro* fertilization (IVF), a physically stressful treatment for infertility that involves intense hormonal stimulation. It has been observed that the use of acupuncture prior to IVF is correlated with increased pregnancy outcomes. In other words, acupuncture seems to increase the chances that IVF will be successful in leading to pregnancy. It is considered good scientific practice to acknowledge and recognize seemingly mysterious phenomena, without insisting on an explanation when there isn’t one.

5. More Anomalies: Aquinas on Miracles, Magic, and Magnets

At the end of the last section, we quoted from the *Summa Theologica*, where Thomas himself answered a question remarkably like Torrance’s. “Whether God can do anything outside the established order of nature?” The question was familiar to both Thomas and his mentor Albert the Great, and they had developed sophisticated, and prescient, answers to a seemingly twenty-first century question. Albert’s opinion is well-known. Even though “he acknowledged (with every other medieval thinker) that God is ultimately the cause of everything,” he realized that the natural philosopher’s toolset is different than the

theologian's.¹⁰ Both thinkers made a conceptual distinction between what we know with our senses and sacred doctrine, referring to what is divinely revealed including things held by authority. In Albert the distinction was more than conceptual, it was curricular: for example, he avoids theology in his works on physics (Grant 2007, 251-52).

What *is* within their toolset will at this point be familiar to us: *seeing motion*, which they got from Aristotle, but they would have included our other human senses. Thomas makes that clear in a section from his *Commentary on the Sentences*: "I respond that we should say the empyrean heaven cannot be investigated by reason. For whatever we cognize about the heavens, this is either via observation or via change; but the empyrean heaven is subject neither to change nor to observation ... and so not to natural reason either, but it is held on authority."¹¹ Thomas's way of putting it is truly stark: if it cannot be seen, it cannot be reasoned about. His 'curricular' distinctions sound, superficially at least, as though they could be setting the stage for something like MN. Is this appearance accurate? What emerges is a view of miracles in which they turn out to be a subset of anomalies, but one within which, crucially for our purposes, *it is impossible to empirically distinguish what belongs to which subset*.¹²

Thomas distinguishes miracles in the *strict* sense from miracles in a *wide* sense. Strict sense miracles are "something done outside the order of the entire created nature, under which order every power of a creature is contained. But sometimes miracle may be taken in a wide sense, for whatever exceeds the human power and experience." Examples of the latter include the stone being thrown up in the air (miraculous to the stone), penicillin (to everyone before Fleming), Hogwarts (to muggles), and Pharaoh's sorcerers (to Pharaoh). Although they are not miracles in the strict sense, "they are sometimes nevertheless something real," for example, the frogs that Pharaoh's sorcerers conjured were real frogs (Aquinas *ST*, 1:114.4).

Elsewhere, Thomas lists as a criterion that humans cannot work out how miracles happen because "no man in this life can mentally grasp the essence of God."¹³ Immediately several difficulties present themselves. Sometimes, we are *told* how miracles happen. For example, "the strong east wind" allows Israel to cross the Red Sea on dry ground, but that is still a strict sense miracle. Maybe he means that humans can, in principle, work out how they are done in terms of cause and effect, but the cause *behind that* ("essence of God") is too much for humans to comprehend, at least "in this life." Additionally, human knowledge is variable. What causes wonders in one setting will not in another: "as when a man sees an eclipse without knowing its cause."¹⁴

It would seem Thomas has in mind a theoretical upper limit of knowledge he expects humans to be able to reach in this life. Consider his example, "Wherefore a thing is wonderful to one man, and not at all to others: as an eclipse is to a rustic, but not to an astronomer" (Aquinas *ST*, 1:105.7). Because some humans possess the ability to explain eclipses (i.e., astronomers), he would not consider eclipses miraculous, not even for rustics and not even in the weak sense. What he would have said to a case where an apparent miracle has been subsequently explained—say, we used to find black holes miraculous, but along comes Caltech with an explanation—he never tells us.

However, *none* of these distinctions are at all useful in telling miraculous anomalies from irregular anomalies. It's not within the empirical toolset to name something as having been caused by God, since, by definition, its cause is "absolutely hidden from all" (Aquinas *ST*, 1:105.7). The most an empirical observation can do is eliminate an anomaly from consideration, but what it can never do is identify a miracle. This was Newton's 'mistake,' and countless other Christians' mistakes both before and since: mislabeling something a miracle when the scientist's tools are only competent to call something an anomaly. What Newton thought was a miracle, Laplace had no need for. When a rustic beholds the miracle of

an eclipse, an astronomer says, “Not so fast! Its cause is not hidden from *me*.” What used to seem like the miracle of penicillin, has a cause clear to biologists and chemists.

Which brings us to St Thomas Aquinas’s views on magic, in his little known but wonderfully titled, “A Letter to a Certain Knight beyond the Mountains on the Occult Workings of Nature.” The relevance of the odd treatise to our topic is clear from the opening line: “Since in some natural bodies certain natural activities appear whose principles cannot be understood...” His letter is about anomalies. Thomas’s way of distinguishing what is outside of nature may seem to unusual to us, but it is nonetheless instructive.

According to Thomas, what is natural is whatever is in keeping with the elementary bodies of the same species; we could say in keeping with the raw physical elements. For example, a stone falls downwards because stones are made primarily of earth. However sometimes an outside force, a force from outside of the nature of the *earthly* elements themselves, acts on it: “Actions of this sort, therefore, must be traced to higher principles.” Tides are the obvious example: water should fall downwards and normally it does, unless acted upon by the moon. The moon being a heavenly body, it lies outside of the natural powers of the elements. Magnets are Thomas’s favorite example. Medicines can work that way, too, he says, because they can affect particular parts of the human body, as opposed to affecting all of the body equally. These benign occult phenomena were commonly called natural magic, as opposed to demonic magic, but Thomas himself never used that term.

Given this framework, something gives Thomas pause. It was also seemingly this that prompted “a certain knight beyond the mountains” to write: *sometimes* the effects of these heavenly bodies are inconsistent or even random. As such, what should be categorized as an odd but nonetheless explainable event: what is an anomaly and what is a miracle?

And we think the same thing sometimes happens through the action of God or the good angels. For the fact, that sick people were cured at the shadow of Peter the Apostle or that some illness is dispelled upon contact with a saint’s relics, is not attributable to a form implanted in these bodies, but only to the divine power which uses the bodies for these results.

It is clear that not all the workings of elementary bodies manifesting occult operations are like these. Firstly, the said workings, since they do not arise from some implanted form, are not found commonly in every individual of the same species: for not every bone nor all the relics of the saint heal upon touch, but those of some at sometimes. And so neither does every image have effects of this sort, nor does all water flow and ebb according to the movement of the moon. But certain secret workings are found in some bodies which are likewise found in all which are of the same species—for example, every magnet attracts iron. (Aquinas 1939)

Based on this, we can distinguish three different types of anomalies using Thomas’s framework:

0. Not anomalous after all, if we keep digging more than rustic does (e.g. eclipses).
1. Irregular anomalies (e.g. lack of tides in your bathtub).
2. Regular, predictable anomalies (e.g. magnets).
3. Miraculous anomalies (e.g. relics).

A couple points of clarification. Regarding (2), he expects these to be caused by heavenly powers. *Heavenly* in this context means ‘higher’ than mundane elements like iron or water; namely, anything solar, lunar, and stellar. Regarding (3), this happens when a personal—that is, *not* solar or stellar—higher power causes an event “outside the usual natural course of things.” Only if it’s caused by God apart from any other created being would Thomas consider it a strict-sense miracle.

Apart from it being fascinating to realize that Thomas had views on natural magic, and he bothered to write to a knight about it, how can this help us with our study of MN? The

difference between *irregular* anomalies, currently-unexplainable *regular* anomalies, and *apparently miraculous* anomalies is not fixed, nor could it be, by empirical means. What about Thomas's examples; how should they be categorized?

Magnets would fit with the second. (He was under the impression that magnets had their power from something beyond earth. We know now that the magnetic poles reside beneath the earth's surface, but let that pass.) Likewise, he regards some medicines as anomalous, "as rhubarb always purges a definite humor." Relics is his example of the third: God or angels use relics to convey their power. But what about tides, dramatic healings, Peter's shadow, and eclipses? Into what category should they fall?

What separates magnets, relics, and the tides between the categories, is, and must remain, fluid and contingent. To think otherwise was Newton's 'mistake,' and those places when Thomas himself verges on giving in to the same temptation potentially lead to embarrassment. And he should have known better: after all, that was the point of his eclipse anecdote. Whenever you are tempted to definitively label something a miracle, know that odds are you will end up looking like a rustic, not a scientist. This is how science should work, and in keeping with Kuhnian science, does work.

We begin by noticing unexplainable events that appear to be irregular or random, like the water in your bathtub. Oceans are affected by the moon, why is it not the same for the water in your house? It turns out that your tub has so much less mass than the moon that it's impossible to see the tides there, but they are there nonetheless (if we had a fine-tuned measuring system and the water was spread out over a sufficient distance that the gravity of the moon could make a difference). So, when we look more closely, it turns out to be not an irregular anomaly (1), but only a regular anomaly (2), like how Thomas thought magnets worked. But we should not stop there. It further turns out that the moon, like the magnetic pole, is part of the same empirical system that water and iron are. So, when we look still more closely, what appeared to be a regular anomaly (2) turns out (0) not to be an anomaly after all! Sure enough, the eclipse anecdote proves right, even when Thomas himself is the target: his analysis of tides and magnets is more rustic than scientific.

What is required to identify a miraculous anomaly is not *seeing with your senses*. This takes the theologian's tools. As far as the scientist can see, relics, Peter's shadow, and dramatic healings are all unexplainable, irregular anomalies. One way that such events could move between Thomas's three categories is, if given more data, we find ourselves increasingly curious: *is* that irregular? Maybe it's like the tides in your bathtub. If the story of Peter's healing shadow was meant to be taken historically, maybe we would find that it was a regular anomaly, and as such, subject to further empirical study. Who knows? It may be ripe for Kuhnian paradigm change. But what we must not do is say we are using empirical tools when we are not. "To derive a concept of verification from one field and to clamp it down on all fields is, even when baptized by the sacred name of scientific method"—or even, one might add, *theological* method—"methodological chaos. After all, the nature and limits of verification are determined by the nature and limits of the field of investigation" (Brightman 1937, 149).

There is a punchline to Newton's story. Even though his line about the System wanting a Reformation would suggest that he advocated a God of the gaps, he was also aware of the danger of positing this. An instance can be found in the same work that he uses this line. Newton's interest in alchemy was well-known but he didn't think that natural philosophers should hide behind 'occult qualities' as though it was the same thing as science. In Newton's telling, what was happening was that old-school Aristotelians were using the category of occult qualities as a stand-in for "I don't have any idea how this happens." Their default explanation became, *The occult did it*. Newton, despite his interest in natural magic, had no time for these would-be explanations: "Such occult qualities put a stop to the

improvement of natural philosophy, and therefore of late years have been rejected. To tell us that every species of things is endow'd with an occult specifick quality by which it acts and produces manifest effects is to tell us nothing" (Newton 1704, 3.1). The parallel to Torrance's and Plantinga's phrase, stopping science, is difficult to miss.

This pushes us to see a further reason to defend MN. It's not because MN somehow *constrains* science or reason, rather it is MN's critics who stop science from doing more. Those critics stop anomalies from functioning as they can, at their best. Anomalies should press us to observe unexplained events with curiosity, and to look more closely at the data they didn't notice before. What distinguishes magnets from tides, rhubarb from eclipses? Anomalies press us to keep digging.

6. When Archbishop Bartolucci Needs a Pathologist

We have a guess about what really worries MN's critics. In fact, lots of scientists, philosophers, theologians, both laypeople and clergy, are troubled by the same, and sometimes we are as well. *How should we handle those situations where we seem to need multiple toolsets?* How should they interact? For example, what about when the bishop needs a pathologist, if he is going to do his job? How should scientists regard that, and how should the church interpret the scientist's conclusion? Fortunately, there is a long-standing traditional, theological answer to that question, and it does not involve abandoning methodological naturalism. It is called Rules of the Medical Consultation of the Congregation for the Causes of Saints, and the latest version was written by someone called Archbishop Marcello Bartolucci.

To be declared a saint the church requires reliable evidence of multiple miracles. To judge the evidence they need scientists, normally medical doctors specializing in some specific disease. As the entire process of canonization takes place within the church, and presumably all the participants could be Christians (if the Vatican chooses), maybe this is not unlike what Torrance has in mind when he writes, "there may come a day when there is universal recognition that God exists." How would he think the practice of science would be different "on that day"?

On that day, the question on the lips of every scientist would not be, "What is to be gained by dropping the commitment to MN?" ... Rather, the question that would be asked would be, "What is there to be gained by adopting MN?" It is this latter question that the Christian scientist should be asking himself today... I do not think that scientists would continue to endorse MN, unless it was redefined as a methodology that allowed for the possibility of *supernatural* explanations. (709; 722n23, emphasis added)

The word Torrance may have had in mind in the last sentence is *anomalous*. That is: *Unless MN was redefined as a methodology that allowed for the possibility of anomalous explanations*. Since MN, in keeping with the scientific method generally, already admits the possibility of anomalies, we are already living on that day. "On that day, the question on the lips of every scientist" *is still*: "What is there to be gained by adopting MN?" And the right answer *is still*: what is gained is the distinctive toolset of chemists, physicists, biology, neuroscientists, since it is only with their tools that we are able detect anomalies at all. Remember Thomas: how else can we separate what is due to magnets, tides, rhubarb, and whatever else? Only with that is our curiosity stirred, and we are driven to form hypotheses and test them using tools of our senses. The canonization process bears this out, to which we now turn.

The process for the Medical Consultation of the Congregation for the Causes of Saints is methodologically naturalistic (Bartolucci 2016). An independent Board of Medical Experts, whose competence is in the field of the alleged healing, will investigate. To be

successful, five of the seven experts “have to testify that a complete cure has really taken place and that it cannot be explained.” Further: “Any cure that could be attributed to autosuggestion, anything of the nature of hysteria, etc., will be rigorously excluded. Cures of epilepsy, etc., have been rejected, for it can hardly be proved that the disease will not recur. It is useless to put forward cures where there has been an operation, for it will be held that the operation, rather than the intercession of the servant of God, was responsible for the cure” (Hallett 1952). Additional rules are in place to insure the Board’s autonomy, including financial independence. Because any given verdict of whether a cure was anomalous would be based on our then-current understanding of medicine, the verdict may well change with new medical discoveries. For example, what Thomas attributed to the power of the stars is in fact explicable if you know the chemical properties of rhubarb.

Archbishop Bartolucci thinks it is worth maintaining multiple practices in the mix, each with its own principles of verification: pathology’s tools, ecclesial tools, philosophical tools, and so on. “The 1917 Code of Canon Law established access of the miracle to theologians only after the alleged miracle had been studied and verified by two expert doctors, aside from issues of philosophical and religious consideration. And even today it is so: the scientific aspect remains distinct from the theological” (quoted in Brockhaus 2016). What is the point of keeping the Vatican’s distinction? Or, as Torrance asks, “What is there to be gained by adopting MN?”

Only this: it is the job of the Medical Board as physicians and pathologists to know what can be explained by forming and testing hypotheses using empirical methods, since medical testing is empirical itself. It is not within the Medical Board’s tools to declare whether a miracle has taken place. That is the *church*’s job, since it is within the ecclesiological toolset. What is within the Medical Board’s competence to say? Whether an *anomaly* has taken place. As Professor Uman—he of the ball lighting—might say, “The world is full of things that aren’t understood,” or the authors of a recent study of the microbiomes of mice did say, “We cannot explain this phenomenon.”

7. Swiss Army Knowledge

As we have argued throughout, the objections to MN are based on a confusion about how the scientific method treats anomalies. If that confusion is cleared up, the objections fall away, proving to have been a red herring all along. There is no good reason to abandon the scientific method’s focus on the empirical toolset, and many good reasons to preserve this focus. When Torrance says, “MN requires the Christian scientist *qua* scientist to offer naturalistic explanations” that would only be true if MN forbade anomalous data, if MN insisted on giving up the scientist’s rightful vocation to keep digging.

Torrance looks forward to the day when God’s existence is treated as obvious, presumably the way that gravity is. If it’s not universal, you can safely ignore those who deny it. “On that day it would be hard to imagine that the scientific world would continue to believe that scientists *qua* scientists should discount the possibility of there being theological explanations for natural phenomena.” If his Christian scientists really are functioning as scientists *qua* scientists, *of course* they should discount “theological explanations for natural phenomena,” since *qua* scientists, they are speaking empirically. Why? Theological explanations are not within the scientific toolset; they are within the theologian’s toolset. Theologians, too, have their principles of verification, and among these are tradition, Scripture, reason, and experience. Maybe what Torrance is meaning to ask is, what about when scientists function *qua* theologians or theologians function *qua* scientists?

That would be a worthwhile challenge to our view. Maybe in defending MN, we have nonetheless given away something valuable. We may have distinguished science from theology so thoroughly that we are headed in the direction of Gould’s non-overlapping

magisteria. That would be a mistake. Instead, it is precisely because of our commitment to various sciences (e.g., science of the human mind, psychopharmacology) and various theological disciplines (e.g., moral theology, theological anthropology) that we care that *whatever* science we draw on is done well. We write from a perspective that could be called Science-Engaged Theology. In what remains of our article, we will list a handful of distinguishing features of our vision for a new generation of science and theology.

To understand our proposal, we must return to something we noted above but so far have left unexplained. As far as we can tell, it was Brightman who first distinguished methodological from metaphysical naturalism. And as we learned, much of his argument for MN involves establishing that there are multiple principles of verification: the mathematician's, the historian's, the anthropologist's, and so on. What could be the relevance of this point to what was Brightman's larger goal, that of proposing MN?

It wasn't until just one hundred years before Brightman's lecture that the word *scientist* was coined. It was quite self-consciously an invented term. To many in the early nineteenth century, the decline of the term natural philosophy came with a price. No longer was there single faculty to unify the various empirical disciplines. Instead, it was like "a great empire falling to pieces," so increasingly divided were they into "infinitely small allotments" (Harrison 2015, 160-161). So said William Whewell, who proposed a number of options by which he aimed to help restore that fallen empire. What was missing, he thought, was a "name by which we can designate the students of the knowledge of the material world collectively." He considered nature poker, nature peeper, savens, and scientist. Even though some complained that 'scientist' sounded like a job an American would do, that term eventually won out.

One hundred years after that, as Brightman was writing his presidential address, he was seeing the consequences of this unification. Instead of "infinitely small allotments" (e.g., biologists who work exclusively in sub-sub-subdisciplines), he faced a *too* great empire. What should have been relevant differences among the sciences were elided or smoothed out. He was trying to counteract the belief that, seeing as they were all *scientists*, they were subject to the same methods of verification, be they biologists, historians, anthropologists, and so on. Hence, we can better understand what he meant when he wrote, "To derive a concept of verification from one field and to clamp it down on all fields is, even when baptized by the sacred name of scientific method, not method, but methodological dogmatism." He needed to overturn that dogma if MN would be seen as plausible.

Brightman's insight is still needed today, maybe more than it was in the 1930s. Surveying the past generation's work that has been conducted under the heading 'science and religion,' we can quickly see that both are overly broad categories. You cannot answer the question, *What does science think about that?*, thus constructed, any more than you can say what 'religion' thinks—even though they are sometimes united by a single term (scientists? religionists?). Much of the very best work of the preceding generation has already taken that insight to heart. We should not ask, "What do science and religion say about, for example, evolution?" because it's a hopeless question, thus formed. But, "What can neuroscience of addictions and the Eastern Orthodox liturgy teach us about moral habit formation?"—that would be an excellent, and answerable, topic.

One sign that the overbroadness of the categories is partly to blame is how much attention has been paid to methodology since Barbour's *Religion in an Age of Science*, and even before that book. Who knows how many rival typologies have been proposed for relating science and religion? None of them are fully satisfying. How could they be anything *but* unsatisfying within those categories, thus formed? It was as though every time a typology proved inadequate, what was to blame was the typology: so, we really must do some more study of the rival methodologies. Repeat, *ad nauseam*. And it's still going on.¹⁵ But what

would happen if we set aside methodology, just for a minute, and start with some particular claim that is at home in one or another specific subdiscipline, and then work out, as needed, points of methodology on an *ad hoc* basis. This would be Science-Engaged Theology.

In contrast to the increasing specialization of the last two centuries of science—in fact, this ‘siloiing’ has been taking place in all sorts of areas of knowledge—we propose an analogy with the Swiss Army Knife. Call it Swiss Army Knowledge or, even better, Swiss Army Science—understanding science (*scientia*) in the older sense of natural philosophy.

The point of our analogy is, like the famous knives, seeking knowledge involves a collection of different, well-defined tools. You open wine with the corkscrew, cans with the can opener, and you cut paper with the scissors. Sure, you *can* do all that with a kitchen knife, but cannot do it well. It would not be good ‘science’. We can see with this analogy how the preceding two or so centuries of increasing specialization have their role to play. It enabled the development of well-defined tools, some requiring specialist training. A little bit of siloiing has its place, because different tools require different sets of expertise to wield effectively: often years of practice and enculturation within a tradition. At the same time, there is no point in pretending that you only need one tool, which is what Brightman was trying to remind his contemporaries of: not everything that scientists practice is subject to the same method. Even though they all use what could be called a *knife*, it is a special sort of knife, one containing multiple tools: a Swiss Army Knife.

Swiss Army Knowledge is not an attempt to revive natural philosophy, but we are encouraged to have historical precedent. Within natural philosophy there was, thankfully, no sign of the endless quarantining of faculties, such as we have grown accustomed to in the modern university, *apart from what is required by the tools themselves*. So, you cannot learn about the empyrean realm from physics because it is not subject to sight or motion (i.e., don’t use the screwdriver to open wine). But, there are all sorts of questions that cannot be adequately answered *except* by using multiple tools. Swiss Army Knowledge enables us to see that the tools are different, but inseparable, at least for complex tasks. And for those tasks, you need to know how to use the tools.

What Swiss Army Knowledge doesn’t strive to emulate from natural philosophy is the endless fights to be the queen. Is philosophy the queen of the sciences? So believed Plato. Is it theology? So said Augustine and Aquinas. You need only read the title of Newton’s book to know his answer: *Philosophiæ Naturalis Principia Mathematica*. And, was it a coincidence that Brightman wrote of the chaos that comes with baptizing ‘by the sacred name of scientific method’, only decades after G.E. Moore set the tone for the twentieth century’s take on natural philosophy, with *his* answer, *Principia Ethica* (which dodged the ‘natural’ part), and Whitehead and Russell proposed *their* answer in the *Principia Mathematica* (dispensing with the ‘philosophy’ bit)? What a waste of time.¹⁶ The ruler can be *ad hoc*; call it queen for a day.

Not all of theology need be science-engaged. Many research questions will be fully addressed within a specialized scientific or theological framework. But it is impossible to answer certain questions without drawing on some specific area of theology and some specific science. It is not as though these only involve new questions or arises only within innovative theological methods; they have been there from the beginning. Both Augustine’s and Thomas’s theologies of marriage depend, in part, on biology and anthropology-sociology (as does St Paul’s, in places). One of Thomas’s reasons for opposing polygamy is that, in societies where it is practiced, the plural wives are treated as menials—and according to Thomas marriage should be a “friendship of equality” (Aquinas *SCG*, 3.124). So, who is to say if that is true unless you train, at least a little, in sociology? And, while we are at it, who is to say that children fair better when raised by parents who have equal friendships? Or, consider the fact that premillennialism (the conservative evangelical eschatology) seems

straightforwardly at odds with the standard Enlightenment ‘eschatology’ of, for example, Steven Pinker. All things considered and in the long run, *are* things getting better or worse? Gould’s non-overlapping magisteria could weasel out of this tension, but it’s doubtful if the evangelicals—much less Pinker—want to follow Gould here; nor do we. There is only one reality, but many tools.

We are currently involved with a series of research projects that are trying to put this vision into practice. For example, when the Roman Catholic church funds agricultural development work in Honduras, they need to know about both agroecology and theologies of natural law to tailor their agricultural practices to local ecologies. Or: within medicine, should a Christian view of bodily integrity change the way one understands the relationship between pain management and opioid addiction? Or: how might theologies of habit and belief formation interact with neurobiological research on religious experience? Or: is the latest trend within moral neuroscience—in short, Hume was right all along—a threat to moral theology, or proof that the Christians also had it right? These are not the sorts of questions that can be addressed in the abstract with vague references to science, religion, or naturalism, but topics at the intersection of the specific sub-disciplines of agroecology and natural law, addiction research and theological ethics, neurobiology and Aristotelian-Thomistic theologies of habit.

We have mixed feeling about introducing Science-Engaged Theology this way. After all, our premise is that we should focus less on methodology, and ironically, we have just devoted an article to it. Still we have reason to hope that our opponents could find reason to embrace this view. As one of these critics once put it, “the world as God created it is full of contingencies. Therefore we don’t merely think about it in our armchairs, trying to infer from first principles how many teeth there are in a horse’s mouth; instead we take a look. The same should go for the question how God acts in the world: here we should rely less upon *a priori* theology and more upon empirical inquiry” (Plantinga 1997).

Perhaps we need another moratorium in the style of G.E.M. Anscombe. In the late 1950s she said that we need to take a break from certain moral concepts until we regain a sense of their significance. In the meantime, we should go on calling what is courageous *brave*, what is lustful *unchaste*, honest *truthful*, and hopefully, the answer will eventually present itself. (And her proposal may have been prophetic: twenty years later, MacIntyre wrote *After Virtue*.) Maybe what has before now gone under the label science-and-religion needs to temporally set aside questions of methodology and see where we get. It doesn’t take much to recognize that most of the best contributions in this field have already accepted this implicitly. We have here presented one way of doing this, but Science-Engaged Theology is not the only way; perhaps some updated version of natural philosophy, or something else entirely. The hallmarks of our proposal are a focus on the individual subdisciplines (of whatever field), valuing training in multiple toolsets, positing no in principle queen of the sciences, and a curiosity to always keep digging in the face of anomalies.

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¹ Defining naturalism is controversial even among specialists in the topic. While Torrance is using naturalism to refer to a metaphysical worldview that always and everywhere excludes the possibility of God (or at least God's activity in the created world), the conversation around naturalism is not so simple. For a helpful overview of the issues, see Owen Flanagan's 'Varieties of Naturalism.' For explicitly theistic versions of naturalism, see Fiona Ellis, *God, Value, and Nature*, or Christopher Knight's 'Theistic Naturalism and 'Special' Divine Providence.' Here, we here engage with Torrance on understanding of methodological naturalism but wish to recognize the wider conversation surrounding this subject.

² And even if the word themselves were to blame, that would only indicate a sociological problem, not a conceptual one. See fn9, below.

³ Tellingly, both are *social* scientists, as was Wolterstorff's main example of B.F. Skinner in *Reason Within the Bounds of Religion*. In all of these examples, Vries initial reply seems apt: "Christians can well value behaviorist psychological theory"—and we might add Stark and Simon here—"while denouncing the misguided attempts to pervert such a psychological theory into an entire philosophical anthropology."

⁴ Notwithstanding de Vries's claim on his personal website that "He is properly credited for inventing (1982) the term 'methodological naturalism,' a concept that clarifies a central issue in the philosophy of science," Brightman's lecture was delivered almost fifty years prior. Perhaps more tellingly, J.I. Packer introduced to term to evangelical audiences in 1967 in connection to his critique of 'scientific' interpretation of the Bible. Both the transcript of Brightman's lecture and Packer's book were in Wheaton College Library when de Vries was an Associate Dean there (1979-1989). Thanks to Kevin Nordby for research assistance.

⁵ Torrance 2017, 692-693. Torrance seemingly gets this from Michael Rea (705). However, Rea's objections don't really fit here. Above we noted that MN is used in least two different senses, as distinguished by the *SEP* entry: 'the relation between religion and science' sense (which involves de Vries and Plantinga) and 'the relation between philosophy and science' sense, with which *SEP* is concerned. The book by Rea that Torrance cites is about the latter (Rea 2002). The first sense is roughly concerned with the question, "Should theists practice the scientific method differently than anyone else?" The second is about *philosophical* practice, "Is there more to philosophy than gathering empirical data, and if so, what?"

Rea might well be right that MN and metaphysical naturalism collapse in on themselves in the second sense (establishing that would be a separate question), but they do not in the first. Obviously the two are related, and insights from one might be able to help with the other. Nonetheless, they are different debates and more to the point, Rea's *reasons* for thinking that both varieties of naturalism (metaphysical and methodological) collapse in on themselves are specifically concerned with the relation between philosophy and science, and only apply there. His reasons are irrelevant to the question of scientific method among theists, which Torrance asks.

⁶ Here, Torrance defines MN, somewhat tautologically, by reference to both naturalistically and secularly. But this is what we are trying to figure out: *is* MN a synonym for secular? 'Naturalistic' in this context is ambiguous and loaded.

⁷ Any worthwhile thought experiment will help *both* parties to state their cases in terms of the analogy, thus enabling each to pinpoint where the disagreement really lies. Whether our analogy works would depend on us showing that there is something to be gained by scientists—and volleyball referees—limiting themselves to *what they can see* (empiricism). Torrance, too, could make his claim via the analogy. It would depend on

establishing science's current rules needing improvement. On its face, that is perfectly reasonable; any practice can change its rules, be it volleyball or volcanology. We think there is something to be gained by preserving MN as one of science's rules, but we would agree with Torrance that this is a debate worth having. Among our reasons for wanting to preserve MN is (1) how it allows us to identify anomalies (pressing us to humbly keep digging), and (2) for some of the reasons set out in, ironically enough, Plantinga: the Christian view "of the contingency of nature has been one important source of the emphasis upon the *empirical* character of modern science" (1997). All that is a worthwhile topic for another day.

⁸ While space prevents a full discussion here, Torrance seems to assume an incompatibilist approach to special divine action: if there is a scientific explanation available for any event, then it should not be considered divine action. Either physical causes are effective, or divine causes are operative—but not both. The incompatibilist assumption is far from representative of perspectives on divine action more broadly. This being the case, it is perhaps striking that the compatibilist alternative seems not to have been explored, as it is certainly a live option. If one works with some version of compatibilism, much of Torrance's problem with MN disappears altogether. We have here opted to address his argument on other fronts, but this assumption looms large and will be immediately apparent to those familiar with the relevant literature.

⁹ Suppose that Plantinga or Torrance reply by listing some real-life scientists who do not live up to this ideal. Perhaps Simon or Stark, to say nothing of Richard Dawkins and Jerry Coyne, refuse to keep digging and instead remain content with whatever best fits their preconceived theories, and hence refuse to acknowledge an anomaly. And suppose that the 'bad' scientists outnumber the 'good' ones, the ones who keep digging. What then? Doubtless, this would be a *sociological* problem among the scientific community, but not a problem of proper method. The right answer would be: get more good scientists, not change the scientific method's commitment to empiricism. Speaking for ourselves, we mostly encounter scientists who sound less like Professor Dawkins and more like Professor Uman.

¹⁰ Lindberg 2007, 240-41. Even historians who otherwise disagree vehemently, such as Edward Grant and Andrew Cunningham, agree regarding this point. See Grant 2001, 191ff; Cunningham and Williams 1993.

¹¹ Thanks to Sarah White of the School of History and Mark Thakkar, Philosophy, both of the University of St Andrews, for translating the entire surrounding passage in context, which was invaluable (*Scriptum super Sententiis*, liber I, distinctio II, quaestio 1). Edward Grant produces his own loose translation in Grant 2007, 258.

¹² What about that other *locus classicus* for defining miracle, book X of Hume's *Enquiry*? We interpret Hume as saying what Michael Murray lists, in his textbook, as the *fourth* Humean-style argument for the impossibility of miracles (premises 7.21-7.26; Murray and Rea 2008, 206). To this argument, we share Murray's retort: Hume gives no *a priori* reason to prefer his definition of 'miracle' to any other, and some reason to doubt it since it would make the impossibility of miracles true by definition. As Murray puts it, that seems rather a suspiciously convenient definition in the midst of arguing that miracles are impossible. In fact, Hume himself inadvertently lets so much slip in his footnote to Locke on probability (note 10). (Unlike us, Murray doesn't make the additional claim that this was actually Hume's view, calling it only 'Humean-style'.)

But, what Murray lists as the *third* Humean-style argument, 'the purely anomalous event' argument (premises 7.14-7.20), is stronger than Murray thinks. Hume defines miracle as "a transgression of a law of nature by [1] particular volition of the Deity, or by [2] the interposition of some invisible agent" (note K). Murray reads this as two different ways to say 'God', and he may be right as far as the historical Hume is concerned. But if not every

‘invisible agent’ is divine (as most natural philosophers took for granted; e.g. lunar forces), the argument starts to sound stronger, since it would enable Hume to modify premise 7.16 by positing something *between* ‘divinely caused’ and ‘not caused at all’. See below, on Thomas’s letter to the knight.

¹³ Aquinas *SCG*, 3:101. Some of the difficulty in interpreting Thomas on this is terminological: Latin has no direct equivalent for the English word miracle (neither has Greek, in fact). Instead, in biblical Greek there were four words; to writers of Latin, they were *wonders*. Thomas makes much of this etymology and it proves to be a source of endless puns (all wonders are wonderful, and the like).

¹⁴ Aquinas *ST*, 1.105.7. How would new scientific discoveries impact what is categorized as a miracle? Sometimes, Thomas seems to lean in one direction, positing an *absolute* limit of human knowledge: “as having a cause absolutely hidden from all” and “absolutely wonderful is that which has a cause absolutely hidden.” And, sometimes he leans in the other direction, positing a *relative* limit: which we “are *accustomed* to observe,” “which God does outside those causes which we *know*,” and “beyond the order *commonly* observed in nature.” Thomas got the first of these latter quotes from Augustine, who seemed to believe that there were ‘miraculous’ properties hidden in nature, and maybe expected us to one day discover some of them. See Augustine, *City of God*, XXI.8.

¹⁵ See Coyne 2015, Dennett & Plantinga 2010, Plantinga 2011. Plantinga knows enough theology that he knows better than to claim, simply, that science conflicts with *religion*. Does he mean (for example) that Rodney Stark’s views are incompatible with the views of the current Board of Elders of South Bend Christian Reformed Church? In short, he needs to say whose theology and which science.

¹⁶ A few previous readers disagreed with this sentence more hotly than they did with all our comments on MN put together. Suffice it to say, we cannot fully defend it within these pages, but to preempt some of the more frequently asked questions: (1) Yes, we *have* read *ST* 1:1.5 (the handmaiden passage). (2) No, we don’t think that what Thomas says there fully solves the question. (3) It is not that we necessarily disagree, it is just that ‘noble’ (his word) isn’t a term with an analytically clear meaning; same goes for ‘queen’, come to that, which was our word. (4) We *do* disagree with what he says in the Reply to Objection 2. It meets the objection only by using slight of hand, since it is not the case that *music:arithmetic :: military:politics*. All this would be a topic worth pursuing.